

## Refine Search

### Search Results -

Term	Documents
(25 AND 26 AND 24 AND 39).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	4
(L39 AND L26 AND L25 AND L24 ).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	4

Database:

US Pre-Grant Publication Full-Text Database  
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 Derwent World Patents Index  
 IBM Technical Disclosure Bulletins

Search:

L40

Refine Search

Recall Text



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Interrupt

### Search History

DATE: Friday, June 09, 2006    [Printable Copy](#)    [Create Case](#)

**Set  
Name**  
side by  
side

**Query**

**Hit  
Count**

**Set  
Name**  
result set

*DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ*

<u>L40</u>	L39 and L26 and L25 and L24	4	<u>L40</u>
<u>L39</u>	L22 and (end adj cap) or cap	895023	<u>L39</u>
<u>L38</u>	L30 and (end adj cap) or cap	895023	<u>L38</u>
<u>L37</u>	L36 and (birdcage adj coil)	9	<u>L37</u>
<u>L36</u>	L33 and L24 and L25	143	<u>L36</u>
<u>L35</u>	L33 and L24 and L25 and L27	0	<u>L35</u>
<u>L34</u>	L33 and L24 and L25 and L26	0	<u>L34</u>
<u>L33</u>	324/300-322 or 343/895,867,742 or 600/410	1907	<u>L33</u>
<u>L32</u>	L23 and L22	2	<u>L32</u>
<u>L31</u>	L30 and L22	1	<u>L31</u>

<u>L30</u>	L23 and L24 and L25 and (birdcage adj coil)	112	<u>L30</u>
<u>L29</u>	L23 and L24 and L25 and L26	9	<u>L29</u>
<u>L28</u>	L23 and L24 and L25 and L26 and L27	3	<u>L28</u>
<u>L27</u>	(azimuth\$5 and circumferen\$5)	6604	<u>L27</u>
<u>L26</u>	((annular near opening) or elomgated near segment) or (birdgage adj coil)	30346	<u>L26</u>
<u>L25</u>	((first or second) adj rf or (radio adj frequency)) adj coil	2345	<u>L25</u>
<u>L24</u>	((first or second) adj rf or (radio adj frequency)) and coil	42566	<u>L24</u>
<u>L23</u>	((first or second) adj rf or (radio adj frequency))	215563	<u>L23</u>
<u>L22</u>	(first adj end) and (second adj end) and (third adj end) with ring	119	<u>L22</u>
<u>L21</u>	((radio frequency or RF) adj coil)	8490	<u>L21</u>
<u>L20</u>	4411270	73	<u>L20</u>
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<u>L18</u>	'4050009'.pn.	1	<u>L18</u>
<u>L17</u>	'4502008'.pn.	1	<u>L17</u>
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<u>L16</u>	4751464	49	<u>L16</u>
<u>L15</u>	5751464	10	<u>L15</u>
<u>L14</u>	L13 and L12	8	<u>L14</u>
<u>L13</u>	4793356	78	<u>L13</u>
<u>L12</u>	4799016	43	<u>L12</u>
<i>DB=USPT; PLUR=YES; OP=ADJ</i>			
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<u>L4</u>	'5041790'.pn.	1	<u>L4</u>
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END OF SEARCH HISTORY

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<input checked="" type="checkbox"/>	PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD	4751464	YES	ADJ	L16
<input checked="" type="checkbox"/>	USPT	'4502008'.pn.	YES	ADJ	L17
<input checked="" type="checkbox"/>	USPT	'4050009'.pn.	YES	ADJ	L18
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<input checked="" type="checkbox"/>	PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD	4411270	YES	ADJ	L20
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<input checked="" type="checkbox"/>	PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBDL324/300-322 or 343/895,867,742 or 600/410	YES	ADJ	L33
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<input checked="" type="checkbox"/>	PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBDL22 and (end adj cap) or cap	YES	ADJ	L39
<input checked="" type="checkbox"/>	PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBDL39 and L26 and L25 and L24	YES	ADJ	L40

Please enter the case name:

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### Rules for naming Cases

- Case names can only contain alphanumeric characters including underscore (\_).
- Any other special characters or punctuation characters will be automatically removed prior to saving the case.
- All white space characters will be replaced by an underscore.

## Hit List

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Search Results - Record(s) 1 through 3 of 3 returned.

☐ 1. Document ID: US 20040137872 A1      Relevance Rank: 99

L28: Entry 1 of 3

File: PGPB

Jul 15, 2004

PGPUB-DOCUMENT-NUMBER: 20040137872

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040137872 A1

TITLE: Multiple tuned radio frequency coil for resonance imaging and spectroscopic analysis

PUBLICATION-DATE: July 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Srinivasan, Ravi	Beachwood	OH	US

APPL-NO: 10/722857    [PALM]

DATE FILED: November 26, 2003

RELATED-US-APPL-DATA:

Application is a non-provisional-of-provisional application 60/429909, filed November 29, 2002,

INT-CL-PUBLISHED: [07] H04 B 1/06

US-CL-PUBLISHED: 455/344

US-CL-CURRENT: 455/344

REPRESENTATIVE-FIGURES: 1

ABSTRACT:

A multi-tune radio frequency (RF) coil for concurrent magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) is disclosed. The multi-tune RF coil includes a first end ring having a generally annular opening and a first plurality of elongated segments coupled to and positioned circumferentially around the first end ring. The first plurality of elongated segments are azimuthally offset from one another by a substantially equal angular distance. A second RF coil includes a second end ring having a generally annular opening and a second plurality of elongated segments coupled to and positioned circumferentially around the second end ring. The second plurality of elongated segments are azimuthally offset from one another by a substantially equal angular distance. The first and

second plurality of elongated segments are coupled to and positioned circumferentially around at least one of an a third end ring having a generally annular opening and an end cap, thereby forming a coil volume, and the first and second plurality of elongated segments lie in a same circumferential plane.

## CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This Application claims priority from U.S. Provisional Application Serial No. 60/429,909 filed Nov. 29, 2002, which is incorporated herein by reference.

Full	Title	Citation	Front	Revel	Classification	Date	Reference	Sequences	Attachments	Claims	DOC	Unsol
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☐ 2. Document ID: US 6992486 B2      Relevance Rank: 81

L28: Entry 3 of 3

File: USPT

Jan 31, 2006

US-PAT-NO: 6992486

DOCUMENT-IDENTIFIER: US 6992486 B2

TITLE: Radio frequency coil for resonance imaging analysis of pediatric patients

DATE-ISSUED: January 31, 2006

## PRIOR-PUBLICATION:

DOC-ID

DATE

US 20040075437 A1

April 22, 2004

## INVENTOR-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

Srinivasan; Ravi

Beachwood

OH

US

## ASSIGNEE-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

TYPE CODE

Advanced Imaging Research, Inc.

Cleveland OH

US

02

APPL-NO: 10/722760      [PALM]

DATE FILED: November 26, 2003

## RELATED-US-APPL-DATA:

continuation-in-part parent-doc US 10440054 00 20030516 ABANDONED child-doc US 10722760

us-provisional-application US 60381160 00 20020516

us-provisional-application US 60429912 00 20021129

## INT-CL-ISSUED:

TYPE IPC

DATE

IPC-OLD

IPCP G01V3/00

20060101

G01V003/00

## INT-CL-CURRENT:

TYPE IPC

DATE

CIPP G01 V 3/00 20060101

US-CL-ISSUED: 324/318; 324/309

US-CL-CURRENT: 324/318; 324/309

FIELD-OF-CLASSIFICATION-SEARCH: 324/318, 324/319, 324/322, 324/309, 324/307, 324/300, 128/653, 600/407

See application file for complete search history.

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4411270</u>	October 1983	Damadian	
<u>4467282</u>	August 1984	Siebold	
<u>4707664</u>	November 1987	Fehn et al.	
<u>4751464</u>	June 1988	Bridges	
<u>4783641</u>	November 1988	Hayes et al.	
<u>4793356</u>	December 1988	Misic et al.	
<u>5525905</u>	June 1996	Mohapatra et al.	
<u>5602479</u>	February 1997	Srinivasan et al.	324/318
<u>5619996</u>	April 1997	Beresten	
<u>5823960</u>	October 1998	Young et al.	
<u>5990681</u>	November 1999	Richard et al.	
<u>6029082</u>	February 2000	Srinivasan et al.	600/422
<u>6177797</u>	January 2001	Srinivasan	324/318
<u>6366798</u>	April 2002	Green	
<u>6611702</u>	August 2003	Rohling et al.	
<u>2004/0075437</u>	April 2004	Srinivasan	

## FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
WO 0098/48756	November 1998	WO	
02/083053	October 2002	WO	

ART-UNIT: 2859

PRIMARY-EXAMINER: Shrivastav; Brij B.

ATTY-AGENT-FIRM: Renner, Otto, Boisselle &amp; Sklar, LLP

ABSTRACT:

A radio frequency (RF) pediatric coil for magnetic resonance/imaging analysis is disclosed. The coil includes a first end ring having a generally annular opening,

and at least one of a second end ring and an end cap. An anterior extension is formed on the first end ring and on the at least one of the second end ring and the end cap. A plurality of elongated segments are coupled to and positioned circumferentially around the first end ring and the at least one of the second end ring and the end cap to form a coil volume. A first elongated segment and a second elongated segment are spaced about the anterior extension to facilitate access into the coil volume. The coil can be implemented as a standalone coil, or it can be operatively coupled to an incubator to increase the resolution of magnetic resonance scans of a neonate inside the incubator.

35 Claims, 16 Drawing figures

Full	Title	Patent	Front	Review	Classification	Date	Reference			Claims	Pub	Draw
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☐ 3. Document ID: US 20040075437 A1      Relevance Rank: 78

L28: Entry 2 of 3

File: PGPB

Apr 22, 2004

PGPUB-DOCUMENT-NUMBER: 20040075437

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040075437 A1

TITLE: Radio frequency coil for resonance imaging analysis of pediatric patients

PUBLICATION-DATE: April 22, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Srinivasan, Ravi	Beachwood	OH	US

APPL-NO: 10/722760      [PALM]

DATE FILED: November 26, 2003

RELATED-US-APPL-DATA:

child 10722760 A1 20031126

parent continuation-in-part-of 10440054 20030516 US PENDING

non-provisional-of-provisional 60381160 20020516 US

non-provisional-of-provisional 60429912 20021129 US

INT-CL-PUBLISHED: [07] G01 V 3/00

US-CL-PUBLISHED: 324/318

US-CL-CURRENT: 324/318

REPRESENTATIVE-FIGURES: 3

ABSTRACT:

A radio frequency (RF) pediatric coil for magnetic resonance/imaging analysis is disclosed. The coil includes a first end ring having a generally annular opening, and at least one of a second end ring and an end cap. An anterior extension is



formed on the first end ring and on the at least one of the second end ring and the end cap. A plurality of elongated segments are coupled to and positioned circumferentially around the first end ring and the at least one of the second end ring and the end cap to form a coil volume. A first elongated segment and a second elongated segment are spaced about the anterior extension to facilitate access into the coil volume. The coil can be implemented as a standalone coil, or it can be operatively coupled to an incubator to increase the resolution of magnetic resonance scans of a neonate inside the incubator.

## CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This Application claims priority from U.S. Provisional Application Serial No. 60/429,912 filed on Nov. 29, 2002 and is a continuation-in-part of application Ser. No. 10/440,054 filed May 16, 2003, which claims priority from U.S. Provisional Application Serial No. 60/381,160 filed on May 16, 2002.

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KMC	Draw D
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Term	Documents
(25 AND 26 AND 27 AND 23 AND 24) .PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	3
(L23 AND L24 AND L25 AND L26 AND L27 ) .PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	3

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Search Results - Record(s) 1 through 4 of 4 returned.

☐ 1. Document ID: US 20040137872 A1      Relevance Rank: 99

L40: Entry 1 of 4

File: PGPB

Jul 15, 2004

PGPUB-DOCUMENT-NUMBER: 20040137872

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040137872 A1

TITLE: Multiple tuned radio frequency coil for resonance imaging and spectroscopic analysis

PUBLICATION-DATE: July 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Srinivasan, Ravi	Beachwood	OH	US

APPL-NO: 10/722857    [PALM]

DATE FILED: November 26, 2003

RELATED-US-APPL-DATA:

Application is a non-provisional-of-provisional application 60/429909, filed November 29, 2002,

INT-CL-PUBLISHED: [07] H04 B 1/06

US-CL-PUBLISHED: 455/344

US-CL-CURRENT: 455/344

REPRESENTATIVE-FIGURES: 1

ABSTRACT:

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Full	Title	Citation	Front	Revised	Classification	Date	References	Sequences	Attachments	Claims	IPC	Unsub U
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☐ 2. Document ID: US 6992486 B2      Relevance Rank: 74

L40: Entry 3 of 4

File: USPT

Jan 31, 2006

US-PAT-NO: 6992486

DOCUMENT-IDENTIFIER: US 6992486 B2

TITLE: Radio frequency coil for resonance imaging analysis of pediatric patients

DATE-ISSUED: January 31, 2006

## PRIOR-PUBLICATION:

DOC-ID

DATE

US 20040075437 A1

April 22, 2004

## INVENTOR-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

Srinivasan; Ravi

Beachwood

OH

US

## ASSIGNEE-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

TYPE CODE

Advanced Imaging Research, Inc.

Cleveland OH

US

02

APPL-NO: 10/722760      [PALM]

DATE FILED: November 26, 2003

## RELATED-US-APPL-DATA:

continuation-in-part parent-doc US 10440054 00 20030516 ABANDONED child-doc US 10722760

us-provisional-application US 60381160 00 20020516

us-provisional-application US 60429912 00 20021129

## INT-CL-ISSUED:

TYPE IPC

DATE

IPC-OLD

IPCP G01V3/00

20060101

G01V003/00

## INT-CL-CURRENT:

TYPE IPC

DATE

CIPP G01 V 3/00 20060101

US-CL-ISSUED: 324/318; 324/309

US-CL-CURRENT: 324/318; 324/309

FIELD-OF-CLASSIFICATION-SEARCH: 324/318, 324/319, 324/322, 324/309, 324/307, 324/300, 128/653, 600/407

See application file for complete search history.

PRIOR-ART-DISCLOSED:

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<u>4793356</u>	December 1988	Misic et al.	
<u>5525905</u>	June 1996	Mohapatra et al.	
<u>5602479</u>	February 1997	Srinivasan et al.	324/318
<u>5619996</u>	April 1997	Beresten	
<u>5823960</u>	October 1998	Young et al.	
<u>5990681</u>	November 1999	Richard et al.	
<u>6029082</u>	February 2000	Srinivasan et al.	600/422
<u>6177797</u>	January 2001	Srinivasan	324/318
<u>6366798</u>	April 2002	Green	
<u>6611702</u>	August 2003	Rohling et al.	
<u>2004/0075437</u>	April 2004	Srinivasan	

## FOREIGN PATENT DOCUMENTS

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02/083053	October 2002	WO	

ART-UNIT: 2859

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ATTY-AGENT-FIRM: Renner, Otto, Boisselle &amp; Sklar, LLP

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35 Claims, 16 Drawing figures

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☐ 3. Document ID: US 20040075437 A1      Relevance Rank: 74

L40: Entry 2 of 4

File: PGPB

Apr 22, 2004

PGPUB-DOCUMENT-NUMBER: 20040075437

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040075437 A1

TITLE: Radio frequency coil for resonance imaging analysis of pediatric patients

PUBLICATION-DATE: April 22, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Srinivasan, Ravi	Beachwood	OH	US

APPL-NO: 10/722760      [PALM]

DATE FILED: November 26, 2003

RELATED-US-APPL-DATA:

child 10722760 A1 20031126

parent continuation-in-part-of 10440054 20030516 US PENDING

non-provisional-of-provisional 60381160 20020516 US

non-provisional-of-provisional 60429912 20021129 US

INT-CL-PUBLISHED: [07] G01 V 3/00

US-CL-PUBLISHED: 324/318

US-CL-CURRENT: 324/318

REPRESENTATIVE-FIGURES: 3

ABSTRACT:

A radio frequency (RF) pediatric coil for magnetic resonance/imaging analysis is disclosed. The coil includes a first end ring having a generally annular opening, and at least one of a second end ring and an end cap. An anterior extension is

formed on the first end ring and on the at least one of the second end ring and the end cap. A plurality of elongated segments are coupled to and positioned circumferentially around the first end ring and the at least one of the second end ring and the end cap to form a coil volume. A first elongated segment and a second elongated segment are spaced about the anterior extension to facilitate access into the coil volume. The coil can be implemented as a standalone coil, or it can be operatively coupled to an incubator to increase the resolution of magnetic resonance scans of a neonate inside the incubator.

## CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This Application claims priority from U.S. Provisional Application Serial No. 60/429,912 filed on Nov. 29, 2002 and is a continuation-in-part of application Ser. No. 10/440,054 filed May 16, 2003, which claims priority from U.S. Provisional Application Serial No. 60/381,160 filed on May 16, 2002.

Full	Title	Station	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWD	Draw D
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☐ 4. Document ID: US 3044301 A      Relevance Rank: 25

L40: Entry 4 of 4

File: USOC

Jul 17, 1962

US-PAT-NO: 3044301

DOCUMENT-IDENTIFIER: US 3044301 A

TITLE: Space simulating device and method

DATE-ISSUED: July 17, 1962

US-CL-CURRENT: 73/865.6; 313/231.31, 73/117.1

## DOCUMENT TEXT:

July 17, 1962 W.H.BENNETT 3044,301 SPACE SIMULATING DEVICE AND METHOD Filed July 23, 1960 20 21 12 19 13 18 0a 23 40 2 38 20 6 7 4 3 8 41 25 10 42 24 7-- 28 32 3 55 1a 26 14- 16 RNVENTOR 17 5 WILLARD H. BENNETT BY A7TORNEY

Ui-i-'ilted StoLes 3,044,301 SPACE SP,,IUL-'@,T.-zNG DEVICE ANT@D IkleiTI-10D Willard H. Benneft, 174 ChesapeY@@@ St. Waectington, D.C. Fil,ed JL;ly 28, 19CO, Ser. No. 46,040 12 Cliims. (Cl. 73-432) (Granted under Title 35, U.S. Code (1952), s,--c. 26fa) -ne invention described herein may be manufactured and used by or for the Gover=ent of the United States of America for - ,Overnmental purposes without the payment of any royalties thereon or therefor. The present invention relates to space simulating devices and more particularly to a device for producing aiid maintainin@ conditions resembling those in space for investi.-ating the performance of certain devices or phenomena under space conditions. Heretofore investi.-ations in a high vacuum simulatinspace conditions have not been carried out -@vit'i satisfaction because of the difficulty in maintainin.- a continuous hi.-h vacuum around gassy devices. Fiirtner prior art devices permit back-flow of the gases from the surroundin.walls and are r,-strieded to us@@ Niith condensible gases. It is therefore an object of the present invention to provide a d- ,vice for prodlicing and maintainin.- suitable hi.-h vacuum space conditions to condctict investi.-ations therein. Another objec-t of the invention is to provide a device Sul able for stlidying thermal propulsion means involving @t jets of fuel and electric propulsion systems involving ion and electron jets. Still another object is to provide a device which is an ideal means for copin,@ -,vith cesiim ion devices and

## Hit List

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Bkwd Refs

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Search Results - Record(s) 1 through 9 of 9 returned.

☐ 1. Document ID: US 6791321 B2      Relevance Rank: 62

L37: Entry 4 of 9

File: USPT

Sep 14, 2004

US-PAT-NO: 6791321

DOCUMENT-IDENTIFIER: US 6791321 B2

TITLE: Birdcage coils for simultaneous acquisition of spatial harmonics

DATE-ISSUED: September 14, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Willig-Onwuachi; Jacob D.	Brookline	MA		
Brown; Robert W.	Solon	OH		
Shvartsman; Shmaryu M.	Highland Heights	OH		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Koninklijke Philips Electronics N.V.	Eindhoven			NL		03

APPL-NO: 10/173933    [PALM]

DATE FILED: June 18, 2002

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/309; 324/307, 324/318

US-CL-CURRENT: 324/309; 324/307, 324/318FIELD-OF-CLASSIFICATION-SEARCH: 324/300, 324/307, 324/309, 324/318, 324/909, 324/322, 600/410, 600/422, 600/425

See application file for complete search history.

## PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4680548</u>	July 1987	Edelstein et al.	324/318
<u>5374890</u>	December 1994	Zou et al.	324/318
<u>5412322</u>	May 1995	Wollin	324/318

<u>5543711</u>	August 1996	Srinivasan et al.	324/318
<u>5602479</u>	February 1997	Srinivasan et al.	324/318
<u>5898306</u>	April 1999	Liu et al.	324/322
<u>5910728</u>	June 1999	Sodickson	324/309
<u>5990681</u>	November 1999	Richard et al.	324/318
<u>5998999</u>	December 1999	Richard et al.	324/318
<u>6029082</u>	February 2000	Srinivasan et al.	600/422
<u>6043658</u>	March 2000	Leussler	324/318
<u>6100694</u>	August 2000	Wong	324/318
<u>6198288</u>	March 2001	Gauss et al.	324/322
<u>6211677</u>	April 2001	Burl et al.	324/322
<u>6316941</u>	November 2001	Fujita et al.	324/318
<u>6377044</u>	April 2002	Burl et al.	324/307
<u>6396271</u>	May 2002	Burl et al.	324/318
<u>6404199</u>	June 2002	Fujita et al.	324/318
<u>6420871</u>	July 2002	Wong et al.	324/318
<u>6477399</u>	November 2002	Biswal et al.	<u>600/410</u>
<u>6522143</u>	February 2003	Fujita et al.	324/318
<u>6591128</u>	July 2003	Wu et al.	600/422

## OTHER PUBLICATIONS

Hayes, et al., "An Efficient, Highly Homogeneous Radiofrequency Coil for Whole-Body NMR Imaging at 1.5 T", Journ. of Magn. Resonance, 63, 622-628 (1985).  
 Sodickson, et al., "Simultaneous Acquisition of Spatial Harmonics (SMASH) : Fast Imaging with Radiofrequency Coil Arrays", MRM 38:591-603 (1997).  
 Jakob, et al., "Auto-Smash: A self-Calibrating Technique for SMASH Imaging", Magnetic Resonance Materials in Physics, Biology & Medicine 7 (1998) 42-54.  
 Leussler, et al., "The Bandpass Birdcage Resonator Modified as a Coil Array For Simultaneous MR Acquisition", 1997.  
 McKenzie, et al., "Optimisation of SMASH Image Reconstructions For Robust In Vivo Imaging", Proceed. of ISMRM--8.sup.th Meeting, Apr. 1, 2000.

ART-UNIT: 2859

PRIMARY-EXAMINER: Gutierrez; Diego

ASSISTANT-EXAMINER: Vargas; Dixomara

ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnich & McKee, LLP

## ABSTRACT:

In a magnetic resonance imaging apparatus, a main magnet assembly (12) produces a uniform magnetic field through an imaging region (14). An imaging region is defined within a subject by selecting gradient magnetic fields spatially encode the main magnetic field. A whole body birdcage radio frequency coil (26) excites magnetic resonance in dipoles of the subject. The resonance signals are received by the whole body coil (26) and by a second, local birdcage radio frequency coil (16). The first radio frequency coil (26) produces and is sensitive to a uniform radio frequency field in the imaging region (14) while the second radio frequency coil (28) is sensitive to a field that varies sinusoidally in space. From one radio frequency excitation, the two birdcage coils (26, 16) receive different sets of



data with which to fill k-space, accelerating data collection.

23 Claims, 5 Drawing figures

Full	Title	Creation	Front	Review	Classification	Date	Reference			Claims	Pub	Unpub
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☐ 2. Document ID: US 6275723 B1      Relevance Rank: 60

L37: Entry 7 of 9

File: USPT

Aug 14, 2001

US-PAT-NO: 6275723

DOCUMENT-IDENTIFIER: US 6275723 B1

TITLE: Method and apparatus for performing neuroimaging

DATE-ISSUED: August 14, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ferris; Craig F.	Holden	MA		
King; Jean A.	Worc	MA		
Allard; Arthur C.	Templeton	MA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Insight Neuroimaging Systems, Inc.	Worcester	MA				02

APPL-NO: 09/169602      [PALM]

DATE FILED: October 9, 1998

PARENT-CASE:

RELATED APPLICATION This application is a C-I-P of U.S. patent application No. 09/073,546, filed May 6, 1998 and abandoned Mar. 27, 2000, and said patent application is incorporated herein by reference.

INT-CL-ISSUED: [07] A61 B 5/055

US-CL-ISSUED: 600/417; 600/422, 324/318

US-CL-CURRENT: 600/417; 324/318, 600/422

FIELD-OF-CLASSIFICATION-SEARCH: 600/410, 600/417, 600/421, 600/422, 600/415, 606/130, 324/309, 324/318

See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO

ISSUE-DATE

PATENTEE-NAME

US-CL

<u>1093112</u>	April 1914	Clarke et al.	606/130
<u>4256112</u>	March 1981	Kopf et al.	128/303
<u>4534050</u>	August 1985	Smith	378/81
<u>4602622</u>	July 1986	Bar et al.	128/303
<u>4617925</u>	October 1986	Laitinen	128/303B
<u>4634980</u>	January 1987	Misic et al.	324/322
<u>4638798</u>	January 1987	Sheldon et al.	128/303B
<u>5154723</u>	October 1992	Kubota et al.	606/130
<u>5281232</u>	January 1994	Hamilton et al.	606/130
<u>5311868</u>	May 1994	Carbini et al.	128/653.5
<u>5311882</u>	May 1994	Gagne et al.	128/845
<u>5330485</u>	July 1994	Clayman et al.	606/130
<u>5370117</u>	December 1994	McLaurin, Jr.	
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<u>5531229</u>	July 1996	Dean et al.	128/866
<u>5588430</u>	December 1996	Bova et al.	128/635.1
<u>5595191</u>	January 1997	Kirk	
<u>5601570</u>	February 1997	Altmann et al.	606/130
<u>5681326</u>	October 1997	Lax	606/130
<u>5738045</u>	April 1998	Bleacher	119/751
<u>5782765</u>	July 1998	Jonkman	600/424
<u>5797924</u>	August 1998	Schulte et al.	606/130
<u>5800353</u>	September 1998	McLaurin, Jr.	600/407
<u>5836878</u>	November 1998	Mock et al.	600/415
<u>5887074</u>	March 1999	Lai et al.	382/128
<u>6138302</u>	October 2000	Sashin et al.	5/600

## OTHER PUBLICATIONS

"Functional MRI Using Awake Animal: Brain Activity Induced by Drinking" by E. Tabuchi, H. N. Mallick, T. Kondoh, T. Ono, and K. Torii, Dept. of Physiology, Toyama Med. & Pharm. Univ. Abstract of conference paper published in the Journal of Physiology, vol. 45, Suppl. 1, 1995.

T. Kamiryo, S. S. Berr, K. S. Lee, N. F. Kassell, and L. Steiner, "Enhanced Magnetic Resonance Imaging of the Rat Brain Using a Stereotactic Device with a Small Head Coil: Technical Note," Acta Neurochir (Wien) 133:87-92 (1995).

ART-UNIT: 377

PRIMARY-EXAMINER: Lateef; Marvin M.

ASSISTANT-EXAMINER: Shaw; Shawna J.

ATTY-AGENT-FIRM: Hamilton, Brook, Smith & Reynolds, P.C.

## ABSTRACT:

The present invention relates to a restraining assembly used in neuroimaging of animals in magnetic resonance imaging (MRI) systems. The body of the animal under study is secured within a tube with a head holder to reduce motion artifacts, particularly when the animal is awake. The tube is placed in the bore of the MRI

system to conduct imaging procedures with a radio frequency coil adjacent to the animals' head.

18 Claims, 14 Drawing figures

Full	Title	Creation	Front	Review	Classification	Date	Reference			Claims	Amc	Draw
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☐ 3. Document ID: US 6211677 B1 Relevance Rank: 57

L37: Entry 8 of 9

File: USPT

Apr 3, 2001

US-PAT-NO: 6211677

DOCUMENT-IDENTIFIER: US 6211677 B1

TITLE: Lung coil for imaging hyper-polarized gas in an MRI scanner

DATE-ISSUED: April 3, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Burl; Michael	Chagrin Falls	OH		
Morich; Michael A.	Mentor	OH		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Picker International, Inc.	Highland Heights	OH			02	

APPL-NO: 09/075117 [PALM]

DATE FILED: May 8, 1998

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/322

US-CL-CURRENT: 324/322

FIELD-OF-CLASSIFICATION-SEARCH: 324/322, 324/307, 324/309, 324/319, 324/318, 324/300, 600/422, 600/421, 600/410

See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4793357</u>	November 1986	Lindstrom	128/654
<u>4930510</u>	November 1988	Lindstrom	128/654
<u>5024230</u>	March 1989	Lindstrom et al.	128/654
<u>5075624</u>	December 1991	Bezjak	324/318
<u>5303707</u>	April 1994	Young	600/422

<u>5365173</u>	February 1993	Zou et al.	324/318
<u>5610521</u>	March 1997	Zou et al.	324/318
<u>5617859</u>	April 1997	Souza et al.	600/422
<u>5680047</u>	August 1995	Srinivasan et al.	324/318
<u>5783943</u>	July 1998	Mastandrea, Jr. et al.	324/318
<u>5990681</u>	October 1997	Richard et al.	324/318
<u>5998999</u>	December 1999	Richard et al.	324/318
<u>6013035</u>	January 2000	Unger et al.	600/562
<u>6081120</u>	June 2000	Shen	324/318

ART-UNIT: 282

PRIMARY-EXAMINER: Oda; Christine

ASSISTANT-EXAMINER: Vargas; Dixomara

ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnich &amp; McKee, LLP

## ABSTRACT:

In a magnetic resonance imaging apparatus, a whole-body RF coil (42) disposed circumferentially around an examination region (14) is tuned to a first Larmor frequency, e.g., that of hydrogen. A first transmitter (44) transmits RF signals at the first Larmor frequency. A first T/R switch (40) electronically switches the whole-body RF coil (42) between a transmit mode in which it is electronically connected to the first transmitter (44) for exciting resonance in hydrogen nuclei, and a receive mode in which it is electronically connected to a first receiver channel for demodulating magnetic resonance signals received from resonating hydrogen nuclei. An insertable lung coil (70) is positioned inside the whole-body RF coil (42) around the examination region. The lung coil (70) is tuned, while the whole-body RF coil (42) is enabled, to a second Larmor frequency corresponding to a non-hydrogen nuclei such that the tuning compensates for reactance from the whole-body RF coil that is inductively coupled to the lung coil. A second T/R switch (80) electronically switches the lung coil (70) between a second transmitter (82) for exciting resonance in non-hydrogen nuclei, and a second receiver channel.

22 Claims, 2 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw D
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☐ 4. Document ID: US 6029082 A      Relevance Rank: 56

L37: Entry 9 of 9

File: USPT

Feb 22, 2000

US-PAT-NO: 6029082

DOCUMENT-IDENTIFIER: US 6029082 A

TITLE: Less-claustrophobic, quadrature, radio-frequency head coil for nuclear magnetic resonance

DATE-ISSUED: February 22, 2000

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Srinivasan; Ravi	Richmond Heights	OH		
Liu; Haiying	Minneapolis	MN		
Elek; Robert A.	Chardon	OH		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Picker International, Inc.	Highland Heights	OH			02	

APPL-NO: 08/976857 [PALM]  
 DATE FILED: November 24, 1997

INT-CL-ISSUED: [07] A61 B 5/055

US-CL-ISSUED: 600/422; 324/318, 324/322  
 US-CL-CURRENT: 600/422; 324/318, 324/322

FIELD-OF-CLASSIFICATION-SEARCH: 600/422, 600/410, 324/318, 324/322  
 See application file for complete search history.

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4692705</u>	September 1987	Hayes	324/318
<u>4769605</u>	September 1988	Fox et al.	324/322
<u>5212450</u>	May 1993	Murphy-Boesch et al.	
<u>5277183</u>	January 1994	Vij	128/653.5
<u>5315251</u>	May 1994	Derby et al.	324/318
<u>5519321</u>	May 1996	Hagen et al.	600/422
<u>5602479</u>	February 1997	Srinivasan et al.	600/422
<u>5619996</u>	April 1997	Beresten	600/422
<u>5663646</u>	September 1997	Kuth et al.	600/422
<u>5664568</u>	September 1997	Srinivasan et al.	600/422

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"Quadrature Detection in the Laboratory Frame." Hoult, et al., Magnetic Resonance in Medicine, v. 1, 339-353 (1984).  
 "A Quadrature Coil for the Adult Human Head." Sank, et al., Journal of Magnetic Resonance, v. 69, 236-242 (1986).  
 "A Quadrature 5x5 Mesh Dome Resonator for Head Imaging and Spectroscopy." Meyer, et al., SMRM 2nd Meeting, San Francisco, Book of Abstracts, 217 (1994).  
 "An Endcap Birdcage Resonator for Quadrature Head Imaging." Hayes, SMRM 5th Annual Meeting, Montreal, Book of Abstracts, Works in Progress, 39-40 (1986).  
 "A Volume Optimized Elliptical Endcap Brain Coil." Wong, et al., SMRM 11th Annual Meeting, Berlin, Book of Abstracts, 4015 (1992).  
 "A Multiple-Frequency Coil with a Highly Uniform B.sub.1 Field." Bollinger, et

al., Journal of Magnetic Resonance, v. 81, 162-166 (1988).

"Quadrature-Headcoil and Helmholtz-Type Neckcoil--an Optimized RF Antenna-Pair for Imaging Head, Neck and C-Spine at 1.0T and 1.5T." Krause, et al., SMRM 7th Annual Meeting, San Francisco, Book of Abstracts, 845 (1988).

"Evaluation of a `True` Dome Quadrature Head Coil for Functional Imaging."

Srinivasan, et al., SMR, 3rd Scientific Meeting, Nice, France, Book of Abstracts, 973 (1995).

"A B.sub.1 Optimized, Hybrid-Quadrature Dome Resonator for Head Imaging."

Srinivasan, et al, SMR, 3rd Scientific Meeting, Nice, France, Book of Abstracts, 972 (1995).

"A Hybrid Birdcage Coil Design for Improved Sensitivity and Homogeneity in Head Imaging and Spectroscopy." Meyer, et al., SMRM 12th Annual Meeting, New York, Book of Abstracts, 217 (1994).

"A User-Friendly, `Open-Faced` Head Coil for MRI at 1.5T." Srinivasan, et al., SMR 4th Scientific Meeting, New York, Book of Abstracts (1996).

ART-UNIT: 377

PRIMARY-EXAMINER: Smith; Ruth S.

ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnich & McKee, LLP

#### ABSTRACT:

A less-claustrophobic, quadrature, radio-frequency head coil (42) includes first and second broken end rings (90, 92) connected to each other in parallel by a plurality of leg conductors (94). At least two of the leg conductors are interconnected by a third arcuate conductor segment (98) axially displaced from planes of the first and second end rings to provide an opening (44) over a subject's face. The opening reduces patient claustrophobia and permits access to the patient for life-support devices or the practice of interventional medicine. The end rings have a fixed capacitance (C.sub.1, C.sub.2) between each pair of leg conductors. The fixed capacitance C.sub.1 between at least one pair of leg conductors and the fixed capacitance C.sub.2 between at least the pair of leg conductors adjacent the opening, where  $C_{sub.2} > C_{sub.1}$ . A two-port feed (66, 68) circumferentially attached to the coil generally opposite the opening matches the individual linear modes. Thus, the radio frequency coil is able to maintain two preferred principal linear modes (A, B) across the open area of the coil.

17 Claims, 7 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw.D
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☐ 5. Document ID: US 20040220468 A1      Relevance Rank: 56

L37: Entry 1 of 9

File: PGPB

Nov 4, 2004

PGPUB-DOCUMENT-NUMBER: 20040220468

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040220468 A1

TITLE: Three axis angle invariant RF coil assembly and method and system employing same

PUBLICATION-DATE: November 4, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Watkins, Ronald	Niskayuna	NY	US
Dumoulin, Charles	Ballston Lake	NY	US
Giaquinto, Randy	Burnt Hills	NY	US

APPL-NO: 10/428433 [PALM]

DATE FILED: May 2, 2003

INT-CL-PUBLISHED: [07] A61 B 5/055, G01 V 3/00US-CL-PUBLISHED: 600/410; 600/422, 324/322US-CL-CURRENT: 600/410; 324/322, 600/422

REPRESENTATIVE-FIGURES: 1

## ABSTRACT:

A radio frequency coil assembly for use in a magnetic resonance system comprises a set of conductors for detecting magnetic resonance signals in three orthogonal planes and capacitors for resonating the set of conductors at a predetermined frequency. A conductor of the set of conductors is placed on each edge of a cube-shaped volume and the capacitors are placed on each conductor of the set of conductors such that each conductor has substantially equal effective capacitance.

A four element band pass birdcage coil comprises two square end ring segments, each end ring segment comprising four sides of equal length, and four rungs of length equal to a side of the end ring segment, and wherein four rungs join in respective corners of the end ring segments.

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	MMIC	Draw D.
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☐ 6. Document ID: US 6492810 B1 Relevance Rank: 55

L37: Entry 6 of 9

File: USPT

Dec 10, 2002

US-PAT-NO: 6492810

DOCUMENT-IDENTIFIER: US 6492810 B1

TITLE: Anti-aliasing magnetic resonance device which reduces aliasing from regions outside of the excitation volume

DATE-ISSUED: December 10, 2002

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hajnal; Josphe Vilmos	London			GB

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Koninklijke Philips Electronics N.V.				NL		03

APPL-NO: 09/523898 [PALM]  
DATE FILED: March 13, 2000

## FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
GB	9905727	March 13, 1999

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/309; 324/318, 324/307  
US-CL-CURRENT: 324/309; 324/307, 324/318

FIELD-OF-CLASSIFICATION-SEARCH: 324/309, 324/318, 324/307, 324/311, 324/312, 324/319, 324/320, 324/322, 324/314, 324/306  
See application file for complete search history.

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4715383</u>	December 1987	Ehman et al.	<u>600/410</u>
<u>5386190</u>	January 1995	Takeuchi et al.	324/309
<u>5451875</u>	September 1995	Patrick et al.	324/318
<u>5633585</u>	May 1997	Kuhn	324/307
<u>6100689</u>	August 2000	Huff et al.	324/309
<u>6307373</u>	October 2001	Young	324/322
<u>6380741</u>	April 2002	Hajnal et al.	324/318
<u>6396269</u>	May 2002	Hajnal et al.	324/307

## OTHER PUBLICATIONS

Kruger et al., article "An Orthogonal Correlation Algorithm for Ghost Reduction in MRI". Magnetic Resonance in Medicine No. 38 pp. 678-686 1997. (No month).\*  
J. B. Ra, and C. Y. Rim, article "Fast Imaging Using Subencoding Data Sets from Multiple Detectors". Magnetic Resonance in Medicine No. 30 pp. 142-145 1993. (No month).

ART-UNIT: 2862

PRIMARY-EXAMINER: Lefkowitz; Edward

ASSISTANT-EXAMINER: Fetzner; Tiffany A.

ATTY-AGENT-FIRM: Fry; John J. Lundin; Thomas M.

ABSTRACT:



In magnetic resonance apparatus, particularly magnetic resonance imaging apparatus, it is found that magnetic resonance signals generated in an alias region (D) will be aliased into the signals received by the primary receive coil (4) from the desired signal region (A-B). An additional receive coil 5 is provided to receive the signals from the alias region, and processing means (6) reduces the effect of these alias signals on the resulting desired data.

20 Claims, 6 Drawing figures

Full	Title	Abstract	Front	Review	Classification	Date	Reference		Claims	KLOC	Drawings
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☐ 7. Document ID: US 6788058 B1      Relevance Rank: 55

L37: Entry 5 of 9

File: USPT

Sep 7, 2004

US-PAT-NO: 6788058

DOCUMENT-IDENTIFIER: US 6788058 B1

TITLE: Asymmetric ring dome radio frequency coil

DATE-ISSUED: September 7, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Petropoulos; Labros S.	Solon	OH		
Murphy-Boesch; Joseph	Aurora	OH		
Richmond; Keith	Garrettsville	OH		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
General Electric Company	Schenectady	NY			02

APPL-NO: 10/094378      [PALM]

DATE FILED: March 8, 2002

PARENT-CASE:

CROSS-REFERENCE TO RELATED APPLICATION This application claims the benefit of U.S. provisional patent application Ser. No. 60/270,660 filed Mar. 8, 2001.

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/318

US-CL-CURRENT: 324/318

FIELD-OF-CLASSIFICATION-SEARCH: 324/300-309, 324/318, 324/322, 600/410

See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4680548</u>	July 1987	Edelstein et al.	
<u>4692705</u>	September 1987	Hayes	
<u>4694255</u>	September 1987	Hayes	
<u>4837515</u>	June 1989	Nishihara et al.	324/318
<u>5003265</u>	March 1991	Leussler	324/318
<u>5050605</u>	September 1991	Eydelman et al.	600/422
<u>5144240</u>	September 1992	Mehdizadeh et al.	324/318
<u>5194811</u>	March 1993	Murphy-Boesch et al.	
<u>5202635</u>	April 1993	Srinivasan et al.	
<u>5212450</u>	May 1993	Murphy-Boesch et al.	
<u>5315251</u>	May 1994	Derby	
<u>5515855</u>	May 1996	Meyer et al.	
<u>5565780</u>	October 1996	Derby	324/322
<u>5602479</u>	February 1997	Srinivasan et al.	
<u>5682893</u>	November 1997	Meyer et al.	600/421
<u>5986454</u>	November 1999	Leifer	
<u>6043658</u>	March 2000	Leussler	324/318
<u>6100691</u>	August 2000	Yeung	324/318
<u>6313633</u>	November 2001	Boskamp	324/319
<u>6344745</u>	February 2002	Reisker et al.	324/318
<u>6452393</u>	September 2002	Allen et al.	324/318

## OTHER PUBLICATIONS

Cecil E. Hayes, et al., "An Efficient, Highly Homogeneous Radiofrequency Coil for Whole-Body NMR Imaging at 1.5 T", Journal of Magnetic Resonance 63, 1985, pp. 622-628.

Joseph Murphy-Boesch, et al., "Two Configurations of the Four-Ring Birdcage Coil for .sup.1 H Imaging and .sup.1 H-Decoupled .sup.31 P Spectroscopy of the Human Head", Journal of Magnetic Resonance, Series B 103, 1994, pp. 103-114.

ART-UNIT: 2859

PRIMARY-EXAMINER: Gutierrez; Diego

ASSISTANT-EXAMINER: Vargas; Dixomara

ATTY-AGENT-FIRM: Della Penna; Michael A. Armstrong Teasdale LLP

## ABSTRACT:

A MRI coil having an axis and a first end and an opposite second end with respect to said axis includes a first ring element at the first end, a second ring element, a third ring element, a fourth ring element at the second end where the first ring element encompasses a smaller area than each of the second, third, and fourth ring elements. The coil also includes a plurality of axial elements connected between the first, second, third and fourth ring elements. The third and fourth ring elements are axially closer than the first and second ring elements.

20 Claims, 10 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	FIG	Drawings
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☐ 8. Document ID: US 6982554 B2      Relevance Rank: 55

L37: Entry 2 of 9

File: USPT

Jan 3, 2006

US-PAT-NO: 6982554

DOCUMENT-IDENTIFIER: US 6982554 B2

TITLE: System and method for operating transmit or transmit/receive elements in an MR system

DATE-ISSUED: January 3, 2006

PRIOR-PUBLICATION:

DOC-ID

DATE

US 20050242816 A1

November 3, 2005

INVENTOR-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

Kurpad; Krishna Nagaraj

Madison

WI

US

Wright; Steven M.

College Station

TX

US

Boskamp; Eddy Benjamin

Menomonee Falls

WI

US

ASSIGNEE-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

TYPE CODE

General Electric Company

Schenectady

NY

US

02

APPL-NO: 10/835363      [PALM]

DATE FILED: April 29, 2004

INT-CL-ISSUED:

TYPE IPC

DATE

IPC-OLD

IPCP G01V3/00

20060101

G01V003/00

INT-CL-CURRENT:

TYPE IPC

DATE

CIPP G01 V 3/00

20060101

US-CL-ISSUED: 324/318; 324/319

US-CL-CURRENT: 324/318; 324/319

FIELD-OF-CLASSIFICATION-SEARCH: 324/318, 324/322, 324/319, 324/309, 324/307, 324/300, 600/410

See application file for complete search history.

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>6313633</u>	November 2001	Boskamp	
<u>6400154</u>	June 2002	Tomanek et al.	324/318
<u>6404201</u>	June 2002	Boskamp	
<u>6411090</u>	June 2002	Boskamp	
<u>6429656</u>	August 2002	Domalski	324/318

ART-UNIT: 2859

PRIMARY-EXAMINER: Shrivastav; Brij B.

ATTY-AGENT-FIRM: Vogel; Peter J.

## ABSTRACT:

An MRI system includes an array of series resonant transmit elements 6 and 65 including individual control of RF current in all elements 106, 108, 110, 114, 116, 118, 120. The array 6 and 65 adjusts scan homogeneity during a scan or prescan phase by adjusting amplitude and phase. The array 6 and 65 also selectively excites areas of interest, thus avoiding major power dissipation and avoiding heating in the patient.

19 Claims, 6 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	Keywords	Drawings
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☐ 9. Document ID: US 6836114 B2      Relevance Rank: 55

L37: Entry 3 of 9

File: USPT

Dec 28, 2004

US-PAT-NO: 6836114

DOCUMENT-IDENTIFIER: US 6836114 B2

TITLE: Pulse imaging sequences and methods for T1p-weighted MRI

DATE-ISSUED: December 28, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Reddy; Ravinder	Phoenixville	PA		
Charagundla; Sridhar R.	Morton	PA		
Borthakur; Ari	Philadelphia	PA		
Shapiro; Erik M.	Washington	DC		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP	CODE	COUNTRY	TYPE	CODE
The Trustees of the University of Pennsylvania	Philadelphia	PA				02	

APPL-NO: 10/389502 [PALM]  
 DATE FILED: March 14, 2003

## PARENT-CASE:

REFERENCE TO RELATED APPLICATIONS This application claims priority to U.S. Provisional Application No. 60/364,878 filed Mar. 15, 2002, herein incorporated by reference in its entirety.

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/307; 324/306

US-CL-CURRENT: 324/307; 324/306

FIELD-OF-CLASSIFICATION-SEARCH: 324/307, 324/306, 324/309, 324/312, 324/314, 324/300

See application file for complete search history.

## PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>5001427</u>	March 1991	Fujiwara	324/307
<u>5317264</u>	May 1994	Rommel et al.	324/309
<u>5404882</u>	April 1995	Santyr	<u>600/410</u>
<u>5420510</u>	May 1995	Fairbanks et al.	324/309
<u>5498962</u>	March 1996	Sepponen	324/309

## OTHER PUBLICATIONS

Akella, S.V., et al., "Proteoglycan induced changes in T.sub.1.rho. relaxation of articular cartilage at 4T," Magn. Reson. Med. 46:419-423 (2001).

Aronen, H.J., et al., "3D spin-lock imaging of human gliomas," Magn. Reson. Imaging 17:1001-1010 (1999).

Charagundla, S.R., et al., ".sup.17 O-decoupled .sup.1 H spectroscopy and imaging with a surface coil: STEAM decoupling," J. Magn. Reson. 143:39-44 (2000).

Charagundla, S.R. et al., "Off-resonance proton T.sub.1.rho. dispersion imaging of .sup.17 O-enriched tissue phantoms," Magn. Reson. Med., 39:588-595 (1998).

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- Markkola, A.T., et al., "Determination of T.sub.1.rho. values for head and neck tissues at 0.1T: a comparison to T.sub.1 and T.sub.2 relaxation times," *Magn. Reson. Imaging* 16:377-383 (1998).
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- Virta, A., et al., "T.sub.1.rho. MR imaging characteristics of human anterior

tibial and gastrocnemius muscles," Acad. Radiol. 5:104-110 (1998).

ART-UNIT: 2859

PRIMARY-EXAMINER: Arana; Louis

ATTY-AGENT-FIRM: McConathy; Evelyn H. Dilworth Paxson LLP

ABSTRACT:

Provided are pulse imaging sequences and methods for 2D multi-slice T.sub.1.rho. -weighted and 3D T.sub.1.rho. -weighted magnetic resonance imaging (MRI). Further provided is a self-compensating spin-locking sequence for correcting and reducing artifacts in T.sub.1.rho. -weighted imaging. Also provided is a sequence combining 3D T.sub.1.rho. -weighted MRI with a self-compensating spin-locking pulse for facilitating T.sub.1.rho. -weighted imaging with surface coils.

20 Claims, 15 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference		Claims	KWD	Draw D
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Term	Documents
BIRDCAGE	974
BIRDCAGES	60
COIL	1287860
COILS	427292
((BIRDCAGE ADJ COIL) AND 36).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	9
(L36 AND (BIRDCAGE ADJ COIL) ).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	9

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☐ 1. Document ID: US 6791321 B2      Relevance Rank: 62

L37: Entry 4 of 9

File: USPT

Sep 14, 2004

US-PAT-NO: 6791321

DOCUMENT-IDENTIFIER: US 6791321 B2

TITLE: Birdcage coils for simultaneous acquisition of spatial harmonics

DATE-ISSUED: September 14, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Willig-Onwuachi; Jacob D.	Brookline	MA		
Brown; Robert W.	Solon	OH		
Shvartsman; Shmaryu M.	Highland Heights	OH		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Koninklijke Philips Electronics N.V.	Eindhoven			NL		03

APPL-NO: 10/173933      [PALM]

DATE FILED: June 18, 2002

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/309; 324/307, 324/318

US-CL-CURRENT: 324/309; 324/307, 324/318FIELD-OF-CLASSIFICATION-SEARCH: 324/300, 324/307, 324/309, 324/318, 324/909, 324/322, 600/410, 600/422, 600/425

See application file for complete search history.

## PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4680548</u>	July 1987	Edelstein et al.	324/318
<u>5374890</u>	December 1994	Zou et al.	324/318
<u>5412322</u>	May 1995	Wollin	324/318



<u>5543711</u>	August 1996	Srinivasan et al.	324/318
<u>5602479</u>	February 1997	Srinivasan et al.	324/318
<u>5898306</u>	April 1999	Liu et al.	324/322
<u>5910728</u>	June 1999	Sodickson	324/309
<u>5990681</u>	November 1999	Richard et al.	324/318
<u>5998999</u>	December 1999	Richard et al.	324/318
<u>6029082</u>	February 2000	Srinivasan et al.	600/422
<u>6043658</u>	March 2000	Leussler	324/318
<u>6100694</u>	August 2000	Wong	324/318
<u>6198288</u>	March 2001	Gauss et al.	324/322
<u>6211677</u>	April 2001	Burl et al.	324/322
<u>6316941</u>	November 2001	Fujita et al.	324/318
<u>6377044</u>	April 2002	Burl et al.	324/307
<u>6396271</u>	May 2002	Burl et al.	324/318
<u>6404199</u>	June 2002	Fujita et al.	324/318
<u>6420871</u>	July 2002	Wong et al.	324/318
<u>6477399</u>	November 2002	Biswal et al.	<u>600/410</u>
<u>6522143</u>	February 2003	Fujita et al.	324/318
<u>6591128</u>	July 2003	Wu et al.	600/422

## OTHER PUBLICATIONS

Hayes, et al., "An Efficient, Highly Homogeneous Radiofrequency Coil for Whole-Body NMR Imaging at 1.5 T", Journ. of Magn. Resonance, 63, 622-628 (1985).  
Sodickson, et al., "Simultaneous Acquisition of Spatial Harmonics (SMASH) : Fast Imaging with Radiofrequency Coil Arrays", MRM 38:591-603 (1997).  
Jakob, et al., "Auto-Smash: A self-Calibrating Technique for SMASH Imaging", Magnetic Resonance Materials in Physics, Biology & Medicine 7 (1998) 42-54.  
Leussler, et al., "The Bandpass Birdcage Resonator Modified as a Coil Array For Simultaneous MR Acquisition", 1997.  
McKenzie, et al., "Optimisation of SMASH Image Reconstructions For Robust In Vivo Imaging", Proceed. of ISMRM--8.sup.th Meeting, Apr. 1, 2000.

ART-UNIT: 2859

PRIMARY-EXAMINER: Gutierrez; Diego

ASSISTANT-EXAMINER: Vargas; Dixomara

ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnich &amp; McKee, LLP

## ABSTRACT:

In a magnetic resonance imaging apparatus, a main magnet assembly (12) produces a uniform magnetic field through an imaging region (14). An imaging region is defined within a subject by selecting gradient magnetic fields spatially encode the main magnetic field. A whole body birdcage radio frequency coil (26) excites magnetic resonance in dipoles of the subject. The resonance signals are received by the whole body coil (26) and by a second, local birdcage radio frequency coil (16). The first radio frequency coil (26) produces and is sensitive to a uniform radio frequency field in the imaging region (14) while the second radio frequency coil (28) is sensitive to a field that varies sinusoidally in space. From one radio frequency excitation, the two birdcage coils (26, 16) receive different sets of

data with which to fill k-space, accelerating data collection.

23 Claims, 5 Drawing figures

Full	Title	Creation	Front	Review	Classification	Date	Reference			Claims	DOC	Drawings
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☐ 2. Document ID: US 6275723 B1 Relevance Rank: 60

L37: Entry 7 of 9

File: USPT

Aug 14, 2001

US-PAT-NO: 6275723

DOCUMENT-IDENTIFIER: US 6275723 B1

TITLE: Method and apparatus for performing neuroimaging

DATE-ISSUED: August 14, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ferris; Craig F.	Holden	MA		
King; Jean A.	Worc	MA		
Allard; Arthur C.	Templeton	MA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Insight Neuroimaging Systems, Inc.	Worcester	MA				02

APPL-NO: 09/169602 [PALM]

DATE FILED: October 9, 1998

PARENT-CASE:

RELATED APPLICATION This application is a C-I-P of U.S. patent application No. 09/073,546, filed May 6, 1998 and abandoned Mar. 27, 2000, and said patent application is incorporated herein by reference.

INT-CL-ISSUED: [07] A61 B 5/055

US-CL-ISSUED: 600/417; 600/422, 324/318

US-CL-CURRENT: 600/417; 324/318, 600/422

FIELD-OF-CLASSIFICATION-SEARCH: 600/410, 600/417, 600/421, 600/422, 600/415, 606/130, 324/309, 324/318

See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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<u>1093112</u>	April 1914	Clarke et al.	606/130
<u>4256112</u>	March 1981	Kopf et al.	128/303
<u>4534050</u>	August 1985	Smith	378/81
<u>4602622</u>	July 1986	Bar et al.	128/303
<u>4617925</u>	October 1986	Laitinen	128/303B
<u>4634980</u>	January 1987	Misic et al.	324/322
<u>4638798</u>	January 1987	Sheldon et al.	128/303B
<u>5154723</u>	October 1992	Kubota et al.	606/130
<u>5281232</u>	January 1994	Hamilton et al.	606/130
<u>5311868</u>	May 1994	Carbini et al.	128/653.5
<u>5311882</u>	May 1994	Gagne et al.	128/845
<u>5330485</u>	July 1994	Clayman et al.	606/130
<u>5370117</u>	December 1994	McLaurin, Jr.	
<u>5388580</u>	February 1995	Sullivan et al.	128/653.1
<u>5531229</u>	July 1996	Dean et al.	128/866
<u>5588430</u>	December 1996	Bova et al.	128/635.1
<u>5595191</u>	January 1997	Kirk	
<u>5601570</u>	February 1997	Altmann et al.	606/130
<u>5681326</u>	October 1997	Lax	606/130
<u>5738045</u>	April 1998	Bleacher	119/751
<u>5782765</u>	July 1998	Jonkman	600/424
<u>5797924</u>	August 1998	Schulte et al.	606/130
<u>5800353</u>	September 1998	McLaurin, Jr.	600/407
<u>5836878</u>	November 1998	Mock et al.	600/415
<u>5887074</u>	March 1999	Lai et al.	382/128
<u>6138302</u>	October 2000	Sashin et al.	5/600

## OTHER PUBLICATIONS

"Functional MRI Using Awake Animal: Brain Activity Induced by Drinking" by E. Tabuchi, H. N. Mallick, T. Kondoh, T. Ono, and K. Torii, Dept. of Physiology, Toyama Med. & Pharm. Univ. Abstract of conference paper published in the Journal of Physiology, vol. 45, Suppl. 1, 1995.

T. Kamiryo, S. S. Berr, K. S. Lee, N. F. Kassell, and L. Steiner, "Enhanced Magnetic Resonance Imaging of the Rat Brain Using a Stereotactic Device with a Small Head Coil: Technical Note," Acta Neurochir (Wien) 133:87-92 (1995).

ART-UNIT: 377

PRIMARY-EXAMINER: Lateef; Marvin M.

ASSISTANT-EXAMINER: Shaw; Shawna J.

ATTY-AGENT-FIRM: Hamilton, Brook, Smith & Reynolds, P.C.

## ABSTRACT:

The present invention relates to a restraining assembly used in neuroimaging of animals in magnetic resonance imaging (MRI) systems. The body of the animal under study is secured within a tube with a head holder to reduce motion artifacts, particularly when the animal is awake. The tube is placed in the bore of the MRI

system to conduct imaging procedures with a radio frequency coil adjacent to the animals' head.

18 Claims, 14 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	Draw	Draw
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☐ 3. Document ID: US 6211677 B1 Relevance Rank: 57

L37: Entry 8 of 9

File: USPT

Apr 3, 2001

US-PAT-NO: 6211677

DOCUMENT-IDENTIFIER: US 6211677 B1

TITLE: Lung coil for imaging hyper-polarized gas in an MRI scanner

DATE-ISSUED: April 3, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Burl; Michael	Chagrin Falls	OH		
Morich; Michael A.	Mentor	OH		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Picker International, Inc.	Highland Heights	OH			02	

APPL-NO: 09/075117 [PALM]

DATE FILED: May 8, 1998

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/322

US-CL-CURRENT: 324/322

FIELD-OF-CLASSIFICATION-SEARCH: 324/322, 324/307, 324/309, 324/319, 324/318, 324/300, 600/422, 600/421, 600/410

See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4793357</u>	November 1986	Lindstrom	128/654
<u>4930510</u>	November 1988	Lindstrom	128/654
<u>5024230</u>	March 1989	Lindstrom et al.	128/654
<u>5075624</u>	December 1991	Bezjak	324/318
<u>5303707</u>	April 1994	Young	600/422

<u>5365173</u>	February 1993	Zou et al.	324/318
<u>5610521</u>	March 1997	Zou et al.	324/318
<u>5617859</u>	April 1997	Souza et al.	600/422
<u>5680047</u>	August 1995	Srinivasan et al.	324/318
<u>5783943</u>	July 1998	Mastandrea, Jr. et al.	324/318
<u>5990681</u>	October 1997	Richard et al.	324/318
<u>5998999</u>	December 1999	Richard et al.	324/318
<u>6013035</u>	January 2000	Unger et al.	600/562
<u>6081120</u>	June 2000	Shen	324/318

ART-UNIT: 282

PRIMARY-EXAMINER: Oda; Christine

ASSISTANT-EXAMINER: Vargas; Dixomara

ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnich &amp; McKee, LLP

## ABSTRACT:

In a magnetic resonance imaging apparatus, a whole-body RF coil (42) disposed circumferentially around an examination region (14) is tuned to a first Larmor frequency, e.g., that of hydrogen. A first transmitter (44) transmits RF signals at the first Larmor frequency. A first T/R switch (40) electronically switches the whole-body RF coil (42) between a transmit mode in which it is electronically connected to the first transmitter (44) for exciting resonance in hydrogen nuclei, and a receive mode in which it is electronically connected to a first receiver channel for demodulating magnetic resonance signals received from resonating hydrogen nuclei. An insertable lung coil (70) is positioned inside the whole-body RF coil (42) around the examination region. The lung coil (70) is tuned, while the whole-body RF coil (42) is enabled, to a second Larmor frequency corresponding to a non-hydrogen nuclei such that the tuning compensates for reactance from the whole-body RF coil that is inductively coupled to the lung coil. A second T/R switch (80) electronically switches the lung coil (70) between a second transmitter (82) for exciting resonance in non-hydrogen nuclei, and a second receiver channel.

22 Claims, 2 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWC	Draw D
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☐ 4. Document ID: US 6029082 A      Relevance Rank: 56

L37: Entry 9 of 9

File: USPT

Feb 22, 2000

US-PAT-NO: 6029082

DOCUMENT-IDENTIFIER: US 6029082 A

TITLE: Less-claustrophobic, quadrature, radio-frequency head coil for nuclear magnetic resonance

DATE-ISSUED: February 22, 2000

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Srinivasan; Ravi	Richmond Heights	OH		
Liu; Haiying	Minneapolis	MN		
Elek; Robert A.	Chardon	OH		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Picker International, Inc.	Highland Heights	OH			02

APPL-NO: 08/976857 [PALM]  
DATE FILED: November 24, 1997INT-CL-ISSUED: [07] A61 B 5/055US-CL-ISSUED: 600/422; 324/318, 324/322  
US-CL-CURRENT: 600/422; 324/318, 324/322FIELD-OF-CLASSIFICATION-SEARCH: 600/422, 600/410, 324/318, 324/322  
See application file for complete search history.

## PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4692705</u>	September 1987	Hayes	324/318
<u>4769605</u>	September 1988	Fox et al.	324/322
<u>5212450</u>	May 1993	Murphy-Boesch et al.	
<u>5277183</u>	January 1994	Vij	128/653.5
<u>5315251</u>	May 1994	Derby et al.	324/318
<u>5519321</u>	May 1996	Hagen et al.	600/422
<u>5602479</u>	February 1997	Srinivasan et al.	600/422
<u>5619996</u>	April 1997	Beresten	600/422
<u>5663646</u>	September 1997	Kuth et al.	600/422
<u>5664568</u>	September 1997	Srinivasan et al.	600/422

## OTHER PUBLICATIONS

"Quadrature Detection in the Laboratory Frame." Hoult, et al., Magnetic Resonance in Medicine, v. 1, 339-353 (1984).  
"A Quadrature Coil for the Adult Human Head." Sank, et al., Journal of Magnetic Resonance, v. 69, 236-242 (1986).  
"A Quadrature 5x5 Mesh Dome Resonator for Head Imaging and Spectroscopy." Meyer, et al., SMRM 2nd Meeting, San Francisco, Book of Abstracts, 217 (1994).  
"An Endcap Birdcage Resonator for Quadrature Head Imaging." Hayes, SMRM 5th Annual Meeting, Montreal, Book of Abstracts, Works in Progress, 39-40 (1986).  
"A Volume Optimized Elliptical Endcap Brain Coil." Wong, et al., SMRM 11th Annual Meeting, Berlin, Book of Abstracts, 4015 (1992).  
"A Multiple-Frequency Coil with a Highly Uniform B.sub.1 Field." Bollinger, et

al., Journal of Magnetic Resonance, v. 81, 162-166 (1988).

"Quadrature-Headcoil and Helmholtz-Type Neckcoil--an Optimized RF Antenna-Pair for Imaging Head, Neck and C-Spine at 1.0T and 1.5T." Krause, et al., SMRM 7th Annual Meeting, San Francisco, Book of Abstracts, 845 (1988).

"Evaluation of a `True` Dome Quadrature Head Coil for Functional Imaging."

Srinivasan, et al., SMR, 3rd Scientific Meeting, Nice, France, Book of Abstracts, 973 (1995).

"A B.sub.1 Optimized, Hybrid-Quadrature Dome Resonator for Head Imaging."

Srinivasan, et al, SMR, 3rd Scientific Meeting, Nice, France, Book of Abstracts, 972 (1995).

"A Hybrid Birdcage Coil Design for Improved Sensitivity and Homogeneity in Head Imaging and Spectroscopy." Meyer, et al., SMRM 12th Annual Meeting, New York, Book of Abstracts, 217 (1994).

"A User-Friendly, `Open-Faced` Head Coil for MRI at 1.5T." Srinivasan, et al., SMR 4th Scientific Meeting, New York, Book of Abstracts (1996).

ART-UNIT: 377

PRIMARY-EXAMINER: Smith; Ruth S.

ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnich & McKee, LLP

ABSTRACT:

A less-claustrophobic, quadrature, radio-frequency head coil (42) includes first and second broken end rings (90, 92) connected to each other in parallel by a plurality of leg conductors (94). At least two of the leg conductors are interconnected by a third arcuate conductor segment (98) axially displaced from planes of the first and second end rings to provide an opening (44) over a subject's face. The opening reduces patient claustrophobia and permits access to the patient for life-support devices or the practice of interventional medicine. The end rings have a fixed capacitance (C.sub.1, C.sub.2) between each pair of leg conductors. The fixed capacitance C.sub.1 between at least one pair of leg conductors and the fixed capacitance C.sub.2 between at least the pair of leg conductors adjacent the opening, where  $C_{sub.2} > C_{sub.1}$ . A two-port feed (66, 68) circumferentially attached to the coil generally opposite the opening matches the individual linear modes. Thus, the radio frequency coil is able to maintain two preferred principal linear modes (A, B) across the open area of the coil.

17 Claims, 7 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference		Claims	KMC	Draw Ds
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☐ 5. Document ID: US 20040220468 A1      Relevance Rank: 56

L37: Entry 1 of 9

File: PGPB

Nov 4, 2004

PGPUB-DOCUMENT-NUMBER: 20040220468

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040220468 A1

TITLE: Three axis angle invariant RF coil assembly and method and system employing same

PUBLICATION-DATE: November 4, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Watkins, Ronald	Niskayuna	NY	US
Dumoulin, Charles	Ballston Lake	NY	US
Giaquinto, Randy	Burnt Hills	NY	US

APPL-NO: 10/428433 [PALM]

DATE FILED: May 2, 2003

INT-CL-PUBLISHED: [07] A61 B 5/055, G01 V 3/00US-CL-PUBLISHED: 600/410; 600/422, 324/322US-CL-CURRENT: 600/410; 324/322, 600/422

REPRESENTATIVE-FIGURES: 1

## ABSTRACT:

A radio frequency coil assembly for use in a magnetic resonance system comprises a set of conductors for detecting magnetic resonance signals in three orthogonal planes and capacitors for resonating the set of conductors at a predetermined frequency. A conductor of the set of conductors is placed on each edge of a cube-shaped volume and the capacitors are placed on each conductor of the set of conductors such that each conductor has substantially equal effective capacitance.

A four element band pass birdcage coil comprises two square end ring segments, each end ring segment comprising four sides of equal length, and four rungs of length equal to a side of the end ring segment, and wherein four rungs join in respective corners of the end ring segments.

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	EMC	Draw D.
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☐ 6. Document ID: US 6492810 B1 Relevance Rank: 55

L37: Entry 6 of 9

File: USPT

Dec 10, 2002

US-PAT-NO: 6492810

DOCUMENT-IDENTIFIER: US 6492810 B1

TITLE: Anti-aliasing magnetic resonance device which reduces aliasing from regions outside of the excitation volume

DATE-ISSUED: December 10, 2002

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hajnal; Josphe Vilmos	London			GB



## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
Koninklijke Philips Electronics N.V.				NL		03

APPL-NO: 09/523898 [PALM]

DATE FILED: March 13, 2000

## FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
GB	9905727	March 13, 1999

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/309; 324/318, 324/307

US-CL-CURRENT: 324/309; 324/307, 324/318

FIELD-OF-CLASSIFICATION-SEARCH: 324/309, 324/318, 324/307, 324/311, 324/312, 324/319, 324/320, 324/322, 324/314, 324/306

See application file for complete search history.

## PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4715383</u>	December 1987	Ehman et al.	<u>600/410</u>
<u>5386190</u>	January 1995	Takeuchi et al.	324/309
<u>5451875</u>	September 1995	Patrick et al.	324/318
<u>5633585</u>	May 1997	Kuhn	324/307
<u>6100689</u>	August 2000	Huff et al.	324/309
<u>6307373</u>	October 2001	Young	324/322
<u>6380741</u>	April 2002	Hajnal et al.	324/318
<u>6396269</u>	May 2002	Hajnal et al.	324/307

## OTHER PUBLICATIONS

Kruger et al., article "An Orthogonal Correlation Algorithm for Ghost Reduction in MRI". Magnetic Resonance in Medicine No. 38 pp. 678-686 1997. (No month).\*

J. B. Ra, and C. Y. Rim, article "Fast Imaging Using Subencoding Data Sets from Multiple Detectors". Magnetic Resonance in Medicine No. 30 pp. 142-145 1993. (No month).

ART-UNIT: 2862

PRIMARY-EXAMINER: Lefkowitz; Edward

ASSISTANT-EXAMINER: Fetzner; Tiffany A.

ATTY-AGENT-FIRM: Fry; John J. Lundin; Thomas M.

ABSTRACT:

In magnetic resonance apparatus, particularly magnetic resonance imaging apparatus, it is found that magnetic resonance signals generated in an alias region (D) will be aliased into the signals received by the primary receive coil (4) from the desired signal region (A-B). An additional receive coil 5 is provided to receive the signals from the alias region, and processing means (6) reduces the effect of these alias signals on the resulting desired data.

20 Claims, 6 Drawing figures

Full	Title	Cratn	Front	Review	Classification	Date	Reference		Claims	KMCD	Draw D
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☐ 7. Document ID: US 6788058 B1      Relevance Rank: 55

L37: Entry 5 of 9

File: USPT

Sep 7, 2004

US-PAT-NO: 6788058

DOCUMENT-IDENTIFIER: US 6788058 B1

TITLE: Asymmetric ring dome radio frequency coil

DATE-ISSUED: September 7, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Petropoulos; Labros S.	Solon	OH		
Murphy-Boesch; Joseph	Aurora	OH		
Richmond; Keith	Garrettsville	OH		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
General Electric Company	Schenectady	NY			02

APPL-NO: 10/094378      [PALM]

DATE FILED: March 8, 2002

PARENT-CASE:

CROSS-REFERENCE TO RELATED APPLICATION This application claims the benefit of U.S. provisional patent application Ser. No. 60/270,660 filed Mar. 8, 2001.

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/318

US-CL-CURRENT: 324/318

FIELD-OF-CLASSIFICATION-SEARCH: 324/300-309, 324/318, 324/322, 600/410

See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4680548</u>	July 1987	Edelstein et al.	
<u>4692705</u>	September 1987	Hayes	
<u>4694255</u>	September 1987	Hayes	
<u>4837515</u>	June 1989	Nishihara et al.	324/318
<u>5003265</u>	March 1991	Leussler	324/318
<u>5050605</u>	September 1991	Eydelman et al.	600/422
<u>5144240</u>	September 1992	Mehdizadeh et al.	324/318
<u>5194811</u>	March 1993	Murphy-Boesch et al.	
<u>5202635</u>	April 1993	Srinivasan et al.	
<u>5212450</u>	May 1993	Murphy-Boesch et al.	
<u>5315251</u>	May 1994	Derby	
<u>5515855</u>	May 1996	Meyer et al.	
<u>5565780</u>	October 1996	Derby	324/322
<u>5602479</u>	February 1997	Srinivasan et al.	
<u>5682893</u>	November 1997	Meyer et al.	600/421
<u>5986454</u>	November 1999	Leifer	
<u>6043658</u>	March 2000	Leussler	324/318
<u>6100691</u>	August 2000	Yeung	324/318
<u>6313633</u>	November 2001	Boskamp	324/319
<u>6344745</u>	February 2002	Reisker et al.	324/318
<u>6452393</u>	September 2002	Allen et al.	324/318

## OTHER PUBLICATIONS

Cecil E. Hayes, et al., "An Efficient, Highly Homogeneous Radiofrequency Coil for Whole-Body NMR Imaging at 1.5 T", Journal of Magnetic Resonance 63, 1985, pp. 622-628.

Joseph Murphy-Boesch, et al., "Two Configurations of the Four-Ring Birdcage Coil for .sup.1 H Imaging and .sup.1 H-Decoupled .sup.31 P Spectroscopy of the Human Head", Journal of Magnetic Resonance, Series B 103, 1994, pp. 103-114.

ART-UNIT: 2859

PRIMARY-EXAMINER: Gutierrez; Diego

ASSISTANT-EXAMINER: Vargas; Dixomara

ATTY-AGENT-FIRM: Della Penna; Michael A. Armstrong Teasdale LLP

## ABSTRACT:

A MRI coil having an axis and a first end and an opposite second end with respect to said axis includes a first ring element at the first end, a second ring element, a third ring element, a fourth ring element at the second end where the first ring element encompasses a smaller area than each of the second, third, and fourth ring elements. The coil also includes a plurality of axial elements connected between the first, second, third and fourth ring elements. The third and fourth ring elements are axially closer than the first and second ring elements.

20 Claims, 10 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	WMO	New De
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☐ 8. Document ID: US 6982554 B2      Relevance Rank: 55

L37: Entry 2 of 9

File: USPT

Jan 3, 2006

US-PAT-NO: 6982554

DOCUMENT-IDENTIFIER: US 6982554 B2

TITLE: System and method for operating transmit or transmit/receive elements in an MR system

DATE-ISSUED: January 3, 2006

PRIOR-PUBLICATION:

DOC-ID	DATE
US 20050242816 A1	November 3, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kurpad; Krishna Nagaraj	Madison	WI		US
Wright; Steven M.	College Station	TX		US
Boskamp; Eddy Benjamin	Menomonee Falls	WI		US

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
General Electric Company	Schenectady	NY		US	02

APPL-NO: 10/835363 [PALM]

DATE FILED: April 29, 2004

INT-CL-ISSUED:

TYPE	IPC	DATE	IPC-OLD
IPCP	G01V3/00	20060101	G01V003/00

INT-CL-CURRENT:

TYPE	IPC	DATE
CIPP	G01 V 3/00	20060101

US-CL-ISSUED: 324/318; 324/319

US-CL-CURRENT: 324/318; 324/319

FIELD-OF-CLASSIFICATION-SEARCH: 324/318, 324/322, 324/319, 324/309, 324/307, 324/300, 600/410

See application file for complete search history.

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>6313633</u>	November 2001	Boskamp	
<u>6400154</u>	June 2002	Tomanek et al.	324/318
<u>6404201</u>	June 2002	Boskamp	
<u>6411090</u>	June 2002	Boskamp	
<u>6429656</u>	August 2002	Domalski	324/318

ART-UNIT: 2859

PRIMARY-EXAMINER: Shrivastav; Brij B.

ATTY-AGENT-FIRM: Vogel; Peter J.

## ABSTRACT:

An MRI system includes an array of series resonant transmit elements 6 and 65 including individual control of RF current in all elements 106, 108, 110, 114, 116, 118, 120. The array 6 and 65 adjusts scan homogeneity during a scan or prescan phase by adjusting amplitude and phase. The array 6 and 65 also selectively excites areas of interest, thus avoiding major power dissipation and avoiding heating in the patient.

19 Claims, 6 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	Keywords	Drawings
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☐ 9. Document ID: US 6836114 B2      Relevance Rank: 55

L37: Entry 3 of 9

File: USPT

Dec 28, 2004

US-PAT-NO: 6836114

DOCUMENT-IDENTIFIER: US 6836114 B2

TITLE: Pulse imaging sequences and methods for T1p-weighted MRI

DATE-ISSUED: December 28, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Reddy; Ravinder	Phoenixville	PA		
Charagundla; Sridhar R.	Morton	PA		
Borthakur; Ari	Philadelphia	PA		
Shapiro; Erik M.	Washington	DC		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP	CODE	COUNTRY	TYPE	CODE
The Trustees of the University of Pennsylvania	Philadelphia	PA				02	

APPL-NO: 10/389502 [PALM]

DATE FILED: March 14, 2003

## PARENT-CASE:

REFERENCE TO RELATED APPLICATIONS This application claims priority to U.S. Provisional Application No. 60/364,878 filed Mar. 15, 2002, herein incorporated by reference in its entirety.

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/307; 324/306

US-CL-CURRENT: 324/307; 324/306

FIELD-OF-CLASSIFICATION-SEARCH: 324/307, 324/306, 324/309, 324/312, 324/314, 324/300

See application file for complete search history.

## PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>5001427</u>	March 1991	Fujiwara	324/307
<u>5317264</u>	May 1994	Rommel et al.	324/309
<u>5404882</u>	April 1995	Santyr	<u>600/410</u>
<u>5420510</u>	May 1995	Fairbanks et al.	324/309
<u>5498962</u>	March 1996	Sepponen	324/309

## OTHER PUBLICATIONS

Akella, S.V., et al., "Proteoglycan induced changes in T.sub.1.rho. relaxation of articular cartilage at 4T," Magn. Reson. Med. 46:419-423 (2001).

Aronen, H.J., et al., "3D spin-lock imaging of human gliomas," Magn. Reson. Imaging 17:1001-1010 (1999).

Charagundla, S.R., et al., ".sup.17 O-decoupled .sup.1 H spectroscopy and imaging with a surface coil: STEAM decoupling," J. Magn. Reson. 143:39-44 (2000).

Charagundla, S.R. et al., "Off-resonance proton T.sub.1.rho. dispersion imaging of .sup.17 O-enriched tissue phantoms," Magn. Reson. Med., 39:588-595 (1998).

Charagundla, S.R. et al., "Dynamic .sup.17 O imaging with fast T.sub..rho. dispersion MRI. Proceedings of the International Society of Magnetic Resonance in Medicine, 7.sup.th Scientific Meeting, Philadelphia," 2106 (1999).

Collins, C.M., et al., "SAR and B.sub.1 field distributions in a heterogeneous human head model within a birdcage coil," Magn. Reson. Med. 40:847-856 (1998).

Dixon, W.T., et al., "Myocardial suppression in vivo by spin locking with composite pulses," Magn. Reson. Med. 36:90-94 (1996).

Duvvuri, U., et al., "T.sub.1.rho. -relaxation in articular cartilage: effects of enzymatic degradation," Magn.Reson.Med. 38:863-7 (1997).

Duvvuri, U., et al., "Human knee: in vivo T.sub.1.rho. -weighted MR imaging at 1.5 T--preliminary experience.sup.1," Radiology 220:822-826 (2001).

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- Lattanzio, P.J., et al., "Macromolecule and water magnetization exchange modeling in articular cartilage," *J. Magn. Reson. Med.* 44:840-851 (2000).
- Markkola, A.T., et al., "Spin lock and magnetization transfer imaging of head and neck tumors," *Radiology* 200:369-375 (1996).
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- Markkola, A.T., et al., "Determination of T.sub.1.rho. values for head and neck tissues at 0.1T: a comparison to T.sub.1 and T.sub.2 relaxation times," *Magn. Reson. Imaging* 16:377-383 (1998).
- Meiboom, S., et al., "Modified spin-echo method for measuring nuclear relaxation times," *Rev. Sci. Instrum.* 29:688-691 (1958).
- Mlynarik, V., et al., "The role of relaxation times in monitoring proteoglycan depletion in articular cartilage [In Process Citation]" *J. Magn. Reson. Imaging* 10:497-502 (1999).
- Mow, V.C., et al., "Fundamentals of articular cartilage and meniscus biomechanics. In: W. E.J., eds. *Articular cartilage and knee joint function: basic science and arthroscopy*," New York: Raven (1990).
- Mulkern, R. V., et al., "Spin-lock techniques and CPMG imaging sequences: a critical appraisal of T.sub.1.rho. contrast at 0.15T," *Magn. Reson. Imaging* 7:437-444 (1989).
- Poptani, H., et al., "T.sub.1.rho. imaging of murine brain tumors at 4T.sub.1," *Acad. Radiol.* 8:42-47 (2001).
- Ramadan, U.A., et al. "On- and off-resonance spin-lock MR imaging of normal human brain at 0.1 T: possibilities to modify image contrast," *J. Magn. Reson. Imaging* 16:1191-1199 (1998).
- Reddy, R., et al., "Detection of .sup.17 O by proton T.sub.1.rho. -dispersion imaging," *J. Magn. Reson. B.* 108:276-279 (1995).
- Reddy, R., et al., ".sup.17 O-decoupled .sup.1 H Detection Using a Double-tuned Coil," *Magnetic Resonance Imaging*, vol. 4, No. 9, pp. 1073-1078, (1996).
- Redfield, A.G. "Nuclear Magnetic Resonance Saturation and Rotary Saturation in Solids," *Phys. Rev.* 98:1787 (1955).
- Regatte, R.R., et al., "Proteoglycan Depletion-induced Changes in Transverse Relaxation Maps of Cartilage: Comparison of T2 and T1r," *Acad. Radiol.* 9:1388-1394 (2002).
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ART-UNIT: 2859

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# ABSTRACT:

Provided are pulse imaging sequences and methods for 2D multi-slice T.sub.1.rho. -weighted and 3D T.sub.1.rho. -weighted magnetic resonance imaging (MRI). Further provided is a self-compensating spin-locking sequence for correcting and reducing artifacts in T.sub.1.rho. -weighted imaging. Also provided is a sequence combining 3D T.sub.1.rho. -weighted MRI with a self-compensating spin-locking pulse for facilitating T.sub.1.rho. -weighted imaging with surface coils.

20 Claims, 15 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWD	Draw D.
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